INTERSTATE COMMERCE COMMISSION

# INVESTIGATION OF ACCIDENT TO SOUTHERN PACIFIC LOCOMOTIVE NO. 2833, OPERATED BY SOUTHERN PACIFIC COMPANY, WHICH OCCURRED ONE AND ONE-HALF MILES WEST OF COSGROVE, NEVADA, OCTOBER 3, 1912

REPORT OF CHIEF INSPECTOR OF LOCOMOTIVE BOILERS

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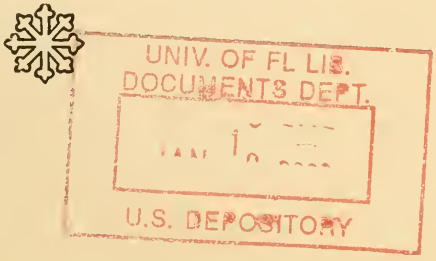


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## REPORT OF THE INVESTIGATION OF ACCIDENT TO SOUTHERN PACIFIC LOCOMOTIVE NO. 2833, OPERATED BY THE SOUTHERN PACIFIC CO., WHICH OCCURRED 1½ MILES WEST OF COSGROVE, NEV., OCTOBER 3, 1912.

WASHINGTON, *December 18, 1912.*

TO THE INTERSTATE COMMERCE COMMISSION:

As provided in section 8 of the locomotive boiler inspection law, the following report of investigation of explosion of Southern Pacific locomotive No. 2833, which occurred on October 3, 1912, at 1.48 p. m., 1½ miles west of Cosgrove, Nev., is respectfully submitted:

This is a consolidated or 2–8–0 type of locomotive with wide 3-piece construction crown-bar type of fire box, built by the Baldwin Locomotive Works in March, 1911, and put in service at Sparks, Nev., October, 1911.

At the time of the accident this locomotive was hauling freight extra west, consisting of 46 cars weighing 1,515 tons. The speed of the train at the time of the accident was estimated at 35 miles per hour; track straight with a slightly descending grade for about 2 miles east from point of accident. The boiler was blown clear of frame and landed approximately 400 feet ahead and 60 feet to the left of the point of the explosion. Four hundred and fifty feet of track was torn up. Engineer N. L. Robinson and Fireman C. C. Cool were killed. No other persons were injured.

Examination of the boiler showed that the right side sheet, with portions of the right side of flue sheet and door sheet and a portion of the crown sheet, had been blown out. This section of the fire box was blown downward, the sheets having doubled at the top edge of the mud ring, and were flattened against the bottom of the mud ring by the boiler rolling to an upright position after landing.

The initial point of failure was in the right side sheet, all of the stay bolts, 382 in number, having pulled out of the sheet. The sheet showed evidence of having been overheated from the third horizontal row of stay bolts above the mud ring, which is the top line of the brickwork, to the top row of stay bolts near the crown sheet, and from the sixth vertical row from flue sheet to the back end of fire box. This sheet, as well as the left side sheet, showed every evidence of having been exceedingly hot. The central part of both side sheets, near the back end of the fire box, had evidently been the

hottest, the temperature having materially decreased near the crown sheet. The flue sheet and flues were tinged with blue from the bottom flues upward, diminishing in hue toward the upper flues. The crown sheet had been overheated from the back end to a point between the fifth and sixth lateral rows of crown bolts from flue sheet, at which point the line of overheating was clearly defined, crossing from side to side, and the sheet in front of this, which was the highest part of the crown sheet, did not show any evidence of overheating. The crown flange seam of the flue sheet did not show the slightest sign of having been overheated. The rivets were intact, and the calking edge not sprung. Neither did the longitudinal corners or bends of fire box between the top rows of stay bolts in side sheets and outside rows of crown bolts show any indications of having been overheated.

There were two fusible plugs in the crown sheet, both in good condition—one of the old standard pattern with five $\frac{5}{16}$-inch holes, fusible-metal filling, component parts of which were: Tin, 1 part; lead, 8 parts; made to fuse at a temperature of 540° F. This plug was located between the first and second lateral rows of crown bolts from the flue sheet, which is the highest point of the crown sheet, and did not show any evidence of having been overheated, as the fusible metal was intact. When removed and tested the fusible-metal filling started to melt at a temperature of 554° F., and all melted out at a temperature of 565° F.

The second fusible plug, known as the Vaughn-Schonfeldt plug, was located 22½ inches from the flue sheet directly over the burner. This plug has a ½-inch opening, into which a solid plug is sweated with a coating of nearly pure tin made to fuse at a temperature of 540° F. When removed and tested the tin fused and plug dropped out at a temperature of 586° F.

All of the flue beads, excepting 22 in the two top rows, were sprung one thirty-second to one-sixteenth of an inch, several of the beads extending straight out. The flues in the interior of the boiler were bent by the force of the explosion, but none shows evidence of overheating and none shows evidence of collapse.

The manner in which the sheets were overheated shows conclusively that this accident was due to the character of the water used on this division, as the hottest portion of the sheets was just above the line of brickwork, about 12 inches from the mud ring, while the fusible plugs in the crown sheet remained intact, and the front end of the crown sheet, which is the highest portion, shows no indication of having been overheated, which is evidence that the water covered this area until the last moment prior to the explosion.

Much of the water used on this division is bad and is of a nature that will not absorb the intense heat generated by a forced oil fire

as rapidly as it can be generated; therefore the water was driven from the sheets at the points which were exposed to the greatest heat of the fire, the result being overheated sheets and the explosion of the boiler.

The water used in this district is treated after it is in the locomotive tender by placing in the tender a certain quantity of a boiler compound designed to neutralize the effect of the impurities in the water and hold it down. While, no doubt, improved conditions result from this water treatment, there still exists a point beyond which it is unsafe to go; therefore extreme care should be exercised, particularly with oil-burning locomotives where water of this character is used, to see that this point is not passed.

An inspection of other locomotives in the same district indicates that, to a lesser degree, similar conditions prevail on those locomotives, as side sheets, door sheets, and crown sheets were found to be bulged at areas corresponding to those which were burned in locomotive No. 2833. This is particularly true of locomotives 2831 and 2832.

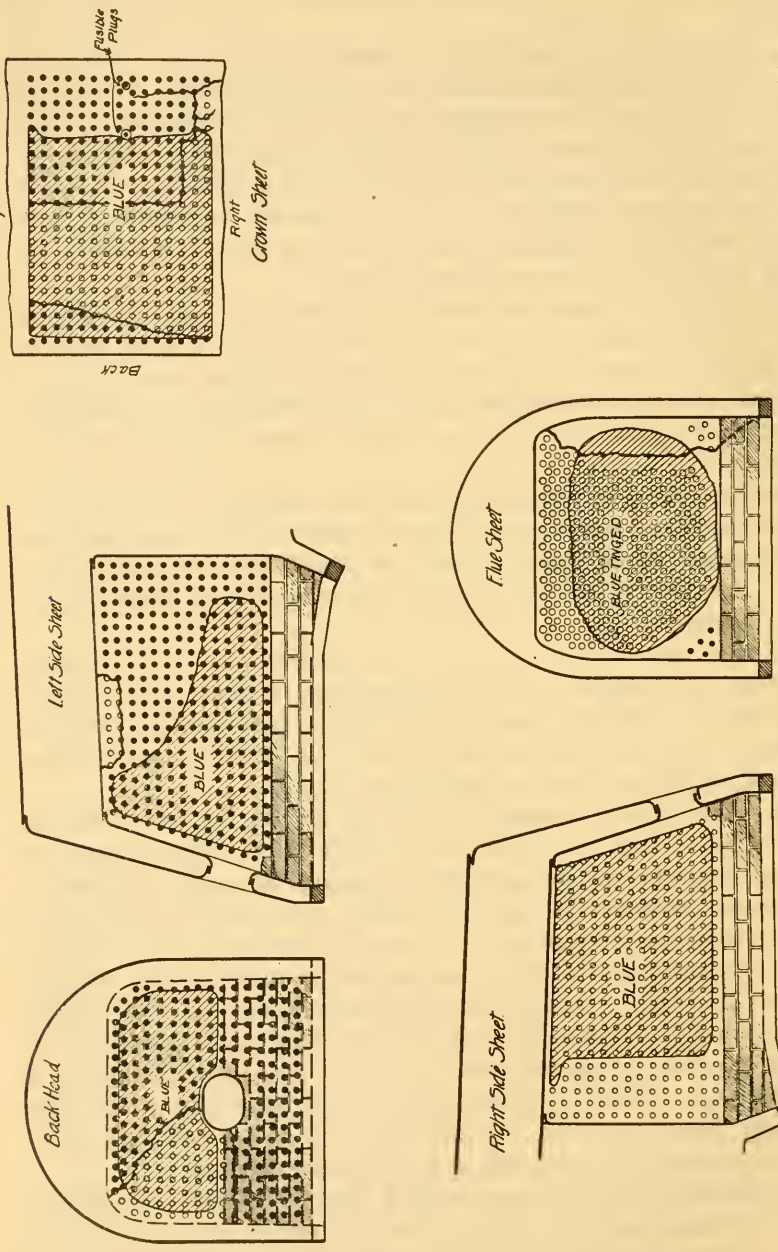
When the life and condition of these locomotives is considered, they having been in service only about one year, it is apparent that the boilers are being forced to such an extent that the light water used in that district will not absorb the intense heat generated by the oil burners.

Until such time as better water can be obtained, it would increase the safety of operation of these locomotives to reduce the tonnage or the speed of trains so that it would not be necessary to force the boilers to an extent which endangers the lives of employees in order to generate sufficient steam to operate the trains.

If it is absolutely necessary that these boilers be forced to use every heat unit that the burners can give forth in order to generate sufficient steam to handle the desired tonnage, or make the time, it would be a safeguard to apply a fusible plug near the back end of the crown sheet at the point where the greatest heat from the burner is concentrated. Applying a fusible plug in this manner may possibly result in increased engine failures, as it is a well-known fact that under certain conditions sufficient heat can be generated by a forced oil fire to fuse the metal in such a plug, even though it is covered by water, but it would serve to give warning that the fire was being forced beyond the point of safety, and would materially add to the safety of operating locomotives in this district.

The condition of the fire-box sheets in locomotive 2833 also demonstrates the fact that the heat from the oil burner is not uniformly diffused throughout the fire box. Correcting this defect will, in a measure, reduce the liability of overheating fire-box sheets which are covered with water.

Boiler appurtenances were in good condition so far as could be determined. Gauge cocks were all broken off, but openings to boiler




The above drawings show the condition of the fire-box sheets after the explosion. Heavy wavy lines show the line of tear and may be followed from the right side sheet across the crown sheet, including parts of the door, tube, and left side sheets. Circles filled in denote location of stay bolts that remained in sheet. Circles not filled in denote holes in sheet as result of stay bolts pulling out. Tubes omitted on right side of flue sheet were pulled out. Cross-hatched inclosure above brickwork denotes overheated sheet.

were found clear. Water glass was found in good condition, and openings to boiler were clear.

Injectors, two No. 11 simplex, and their connections, were in good condition. Steam gauge was destroyed. Safety valves, one 3½-inch muffled and one 3½-inch open, were tested on another locomotive of the same class and found to be in good condition, properly adjusted and of sufficient capacity.

The overheated areas in the fire box are shown in the diagrams contained in this report.

JOHN F. ENSIGN,
*Chief Inspector.*

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